



# Analytical Laboratory

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Huntersville, NC 28078-7929  
McGuire Nuclear Complex - MG03A2  
Phone: 980-875-5245 Fax: 980-875-4349

## Order Summary Report

**Order Number:** J13100218

Project Name: WWTS FGD-Routine 2013

Customer Name(s): Bill K, Wayne C, and Melonie M

Customer Address: 3195 Pine Hall Rd  
Mailcode: Belews Steam Station  
Belews Creek, NC 28012

Lab Contact: Jason C Perkins Phone: 980-875-5348

**Report Authorized By:** \_\_\_\_\_ **Date:** 10/28/2013  
(Signature) Jason C Perkins

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### Program Comments:

Please contact the Program Manager (Jason C Perkins) with any questions regarding this report.

### Data Flags & Calculations:

Any analytical tests or individual analytes within a test flagged with a Qualifier indicate a deviation from the method quality system or quality control requirement. The qualifier description is found at the end of the Certificate of Analysis (sample results) under the qualifiers heading. All results are reported on a dry weight basis unless otherwise noted. Subcontracted data included on the Duke Certificate of Analysis is to be used as information only. Certified vendor results can be found in the subcontracted lab final report. Duke Energy Analytical Laboratory subcontracts analyses to other vendor laboratories that have been qualified by Duke Energy to perform these analyses except where noted.

### Data Package:

This data package includes analytical results that are applicable only to the samples described in this narrative. An estimation of the uncertainty of measurement for the results in the report is available upon request. This report shall not be reproduced, except in full, without the written consent of the Analytical Laboratory. Please contact the Analytical laboratory with any questions. The order of individual sections within this report is as follows:

*Job Summary Report, Sample Identification, Technical Validation of Data Package, Analytical Laboratory Certificate of Analysis, Analytical Laboratory QC Reports, Sub-contracted Laboratory Results, Customer Specific Data Sheets, Reports & Documentation, Customer Database Entries, Test Case Narratives, Chain of Custody (COC)*

### Certification:

The Analytical Laboratory holds the following State Certifications : North Carolina (DENR) Certificate #248, South Carolina (DHEC) Laboratory ID # 99005. Contact the Analytical Laboratory for definitive information about the certification status of specific methods.

Sample ID's & Descriptions:

Sample ID	Plant/Station	Collection Date and Time	Collected By	Sample Description
2013024910	BELEWS	09-Oct-13 7:00 AM	TRAVIS THORNTON	FGD Purge Eff
2013024911	BELEWS	09-Oct-13 7:05 AM	TRAVIS THORNTON	EQ Tank Eff
2013024912	BELEWS	09-Oct-13 7:10 AM	TRAVIS THORNTON	BioReactor 1 Inf
2013024913	BELEWS	09-Oct-13 7:15 AM	TRAVIS THORNTON	BioReactor 2 Inf
2013024914	BELEWS	09-Oct-13 7:20 AM	TRAVIS THORNTON	BioReactor 2 Eff
2013024915	BELEWS	09-Oct-13	TRAVIS THORNTON	Filter Blk
2013024916	BELEWS	09-Oct-13 8:00 AM	TRAVIS THORNTON	TRIP BLANK
7 Total Samples				

## Technical Validation Review

### Checklist:

- |                                                                                                            |                                         |                                        |
|------------------------------------------------------------------------------------------------------------|-----------------------------------------|----------------------------------------|
| COC and .pdf report are in agreement with sample totals and analyses (compliance programs and procedures). | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No            |
| All Results are less than the laboratory reporting limits.                                                 | <input type="checkbox"/> Yes            | <input checked="" type="checkbox"/> No |
| All laboratory QA/QC requirements are acceptable.                                                          | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No            |

### Report Sections Included:

- |                                                                                   |                                                                                      |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> Job Summary Report                            | <input checked="" type="checkbox"/> Sub-contracted Laboratory Results                |
| <input checked="" type="checkbox"/> Sample Identification                         | <input type="checkbox"/> Customer Specific Data Sheets, Reports, & Documentation     |
| <input checked="" type="checkbox"/> Technical Validation of Data Package          | <input type="checkbox"/> Customer Database Entries                                   |
| <input checked="" type="checkbox"/> Analytical Laboratory Certificate of Analysis | <input checked="" type="checkbox"/> Chain of Custody                                 |
| <input type="checkbox"/> Analytical Laboratory QC Report                          | <input checked="" type="checkbox"/> Electronic Data Deliverable (EDD) Sent Separatel |

Reviewed By: DBA Account

Date: 10/28/2013

# Certificate of Laboratory Analysis

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*This report shall not be reproduced, except in full.***Order # J13100218**

Site: FGD Purge Eff

Collection Date: 09-Oct-13 7:00 AM

**Sample #: 2013024910**

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<b><u>NITRITE + NITRATE (COLORIMETRIC)</u></b>								
Nitrite + Nitrate (Colorimetric)	16	mg-N/L		0.1	10	EPA 353.2	10/14/2013 14:06	BGN9034
<b><u>INORGANIC IONS BY IC</u></b>								
Bromide	140	mg/L		5	50	EPA 300.0	10/18/2013 17:52	JAHERMA
<b><u>MERCURY (COLD VAPOR) IN WATER</u></b>								
Mercury (Hg)	167	ug/L		5	100	EPA 245.1	10/18/2013 12:01	DKJOHN2
<b><u>TOTAL RECOVERABLE METALS BY ICP</u></b>								
Boron (B)	517	mg/L		0.5	10	EPA 200.7	10/22/2013 15:07	MHH7131
<b><u>DISSOLVED METALS BY ICP-MS</u></b>								
Selenium (Se)	225	ug/L		10	10	EPA 200.8	10/23/2013 14:14	DJSULL1
<b><u>TOTAL RECOVERABLE METALS BY ICP-MS</u></b>								
Arsenic (As)	152	ug/L		10	10	EPA 200.8	10/22/2013 14:45	DJSULL1
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	10/22/2013 14:45	DJSULL1
Chromium (Cr)	312	ug/L		10	10	EPA 200.8	10/22/2013 14:45	DJSULL1
Copper (Cu)	139	ug/L		10	10	EPA 200.8	10/22/2013 14:45	DJSULL1
Nickel (Ni)	325	ug/L		10	10	EPA 200.8	10/22/2013 14:45	DJSULL1
Selenium (Se)	4020	ug/L		10	10	EPA 200.8	10/22/2013 14:45	DJSULL1
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	10/22/2013 14:45	DJSULL1
Zinc (Zn)	303	ug/L		10	10	EPA 200.8	10/22/2013 14:45	DJSULL1
<b><u>SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)</u></b>								
Vendor Parameter	Complete					Vendor Method		V_AS&C

Site: EQ Tank Eff

Collection Date: 09-Oct-13 7:05 AM

**Sample #: 2013024911**

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<b><u>MERCURY (COLD VAPOR) IN WATER</u></b>								
Mercury (Hg)	113	ug/L		2.5	50	EPA 245.1	10/18/2013 12:39	DKJOHN2
<b><u>TOTAL RECOVERABLE METALS BY ICP</u></b>								
Boron (B)	547	mg/L		0.5	10	EPA 200.7	10/22/2013 15:11	MHH7131
<b><u>DISSOLVED METALS BY ICP-MS</u></b>								
Selenium (Se)	264	ug/L		10	10	EPA 200.8	10/23/2013 14:17	DJSULL1

# Certificate of Laboratory Analysis

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*This report shall not be reproduced, except in full.***Order # J13100218**

Site: EQ Tank Eff

Collection Date: 09-Oct-13 7:05 AM

**Sample #: 2013024911**

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<b><u>TOTAL RECOVERABLE METALS BY ICP-MS</u></b>								
Arsenic (As)	138	ug/L		10	10	EPA 200.8	10/22/2013 14:49	DJSULL1
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	10/22/2013 14:49	DJSULL1
Chromium (Cr)	283	ug/L		10	10	EPA 200.8	10/22/2013 14:49	DJSULL1
Copper (Cu)	130	ug/L		10	10	EPA 200.8	10/22/2013 14:49	DJSULL1
Nickel (Ni)	310	ug/L		10	10	EPA 200.8	10/22/2013 14:49	DJSULL1
Selenium (Se)	3780	ug/L		10	10	EPA 200.8	10/22/2013 14:49	DJSULL1
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	10/22/2013 14:49	DJSULL1
Zinc (Zn)	275	ug/L		10	10	EPA 200.8	10/22/2013 14:49	DJSULL1

Site: BioReactor 1 Inf

Collection Date: 09-Oct-13 7:10 AM

**Sample #: 2013024912**

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<b><u>NITRITE + NITRATE (COLORIMETRIC)</u></b>								
Nitrite + Nitrate (Colorimetric)	21	mg-N/L		0.25	25	EPA 353.2	10/14/2013 14:20	BGN9034
<b><u>Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)</u></b>								
Vendor Parameter	Complete	ug/l				Vendor Method		V_AS&C
<b><u>TOTAL RECOVERABLE METALS BY ICP</u></b>								
Boron (B)	516	mg/L		0.5	10	EPA 200.7	10/22/2013 15:15	MHH7131
<b><u>DISSOLVED METALS BY ICP-MS</u></b>								
Selenium (Se)	143	ug/L		10	10	EPA 200.8	10/23/2013 14:21	DJSULL1
<b><u>TOTAL RECOVERABLE METALS BY ICP-MS</u></b>								
Arsenic (As)	< 10	ug/L		10	10	EPA 200.8	10/22/2013 14:52	DJSULL1
Cadmium (Cd)	< 10	ug/L		10	10	EPA 200.8	10/22/2013 14:52	DJSULL1
Chromium (Cr)	< 10	ug/L		10	10	EPA 200.8	10/22/2013 14:52	DJSULL1
Copper (Cu)	< 10	ug/L		10	10	EPA 200.8	10/22/2013 14:52	DJSULL1
Nickel (Ni)	69.2	ug/L		10	10	EPA 200.8	10/22/2013 14:52	DJSULL1
Selenium (Se)	146	ug/L		10	10	EPA 200.8	10/22/2013 14:52	DJSULL1
Silver (Ag)	< 10	ug/L		10	10	EPA 200.8	10/22/2013 14:52	DJSULL1
Zinc (Zn)	< 10	ug/L		10	10	EPA 200.8	10/22/2013 14:52	DJSULL1
<b><u>SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)</u></b>								
Vendor Parameter	Complete					Vendor Method		V_AS&C

# Certificate of Laboratory Analysis

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Site: BioReactor 2 Inf

Collection Date: 09-Oct-13 7:15 AM

**Sample #: 2013024913**

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<b><u>Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)</u></b>								
Vendor Parameter	<b>Complete</b>	ug/l				Vendor Method		V_AS&C
<b><u>TOTAL RECOVERABLE METALS BY ICP</u></b>								
Boron (B)	<b>485</b>	mg/L		0.5	10	EPA 200.7	10/22/2013 15:19	MHH7131
<b><u>TOTAL RECOVERABLE METALS BY ICP-MS</u></b>								
Arsenic (As)	<b>&lt; 10</b>	ug/L		10	10	EPA 200.8	10/22/2013 14:56	DJSULL1
Cadmium (Cd)	<b>&lt; 10</b>	ug/L		10	10	EPA 200.8	10/22/2013 14:56	DJSULL1
Chromium (Cr)	<b>&lt; 10</b>	ug/L		10	10	EPA 200.8	10/22/2013 14:56	DJSULL1
Copper (Cu)	<b>&lt; 10</b>	ug/L		10	10	EPA 200.8	10/22/2013 14:56	DJSULL1
Nickel (Ni)	<b>&lt; 10</b>	ug/L		10	10	EPA 200.8	10/22/2013 14:56	DJSULL1
Selenium (Se)	<b>26.4</b>	ug/L		10	10	EPA 200.8	10/22/2013 14:56	DJSULL1
Silver (Ag)	<b>&lt; 10</b>	ug/L		10	10	EPA 200.8	10/22/2013 14:56	DJSULL1
Zinc (Zn)	<b>&lt; 10</b>	ug/L		10	10	EPA 200.8	10/22/2013 14:56	DJSULL1

Site: BioReactor 2 Eff

Collection Date: 09-Oct-13 7:20 AM

**Sample #: 2013024914**

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<b><u>NITRITE + NITRATE (COLORIMETRIC)</u></b>								
Nitrite + Nitrate (Colorimetric)	<b>&lt; 0.01</b>	mg-N/L		0.01	1	EPA 353.2	10/14/2013 14:08	BGN9034
<b><u>INORGANIC IONS BY IC</u></b>								
Bromide	<b>120</b>	mg/L		5	50	EPA 300.0	10/18/2013 18:11	JAHERMA
<b><u>Mercury by EPA 200.8 - (Analysis Performed by Applied Speciation and Consulting, LLC)</u></b>								
Vendor Parameter	<b>Complete</b>	ug/l				Vendor Method		V_AS&C
<b><u>TOTAL RECOVERABLE METALS BY ICP</u></b>								
Boron (B)	<b>421</b>	mg/L		0.5	10	EPA 200.7	10/22/2013 15:23	MHH7131
<b><u>TOTAL RECOVERABLE METALS BY ICP-MS</u></b>								
Arsenic (As)	<b>&lt; 5</b>	ug/L		5	5	EPA 200.8	10/22/2013 14:59	DJSULL1
Cadmium (Cd)	<b>&lt; 5</b>	ug/L		5	5	EPA 200.8	10/22/2013 14:59	DJSULL1
Chromium (Cr)	<b>&lt; 5</b>	ug/L		5	5	EPA 200.8	10/22/2013 14:59	DJSULL1
Copper (Cu)	<b>&lt; 5</b>	ug/L		5	5	EPA 200.8	10/22/2013 14:59	DJSULL1
Nickel (Ni)	<b>&lt; 5</b>	ug/L		5	5	EPA 200.8	10/22/2013 14:59	DJSULL1
Selenium (Se)	<b>8.15</b>	ug/L		5	5	EPA 200.8	10/22/2013 14:59	DJSULL1
Silver (Ag)	<b>&lt; 5</b>	ug/L		5	5	EPA 200.8	10/22/2013 14:59	DJSULL1
Zinc (Zn)	<b>&lt; 5</b>	ug/L		5	5	EPA 200.8	10/22/2013 14:59	DJSULL1

# Certificate of Laboratory Analysis

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Site: BioReactor 2 Eff

Collection Date: 09-Oct-13 7:20 AM

**Sample #: 2013024914**

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<b><u>SELENIUM SPECIATION - (Analysis Performed by Applied Speciation and Consulting, LLC)</u></b>								
Vendor Parameter	Complete					Vendor Method		V_AS&C
<b><u>TOTAL DISSOLVED SOLIDS</u></b>								
TDS	22000	mg/L		25	1	SM2540C	10/16/2013 12:42	DSBAKE1

Site: Filter Blk

Collection Date: 09-Oct-13

**Sample #: 2013024915**

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<b><u>DISSOLVED METALS BY ICP-MS</u></b>								
Selenium (Se)	< 1	ug/L		1	1	EPA 200.8	10/23/2013 14:07	DJSULL1

Site: TRIP BLANK

Collection Date: 09-Oct-13 8:00 AM

**Sample #: 2013024916**

Matrix: OTHER

Analyte	Result	Units	Qualifiers	RDL	DF	Method	Analysis Date/Time	Analyst
<b><u>TOTAL RECOVERABLE METALS BY ICP</u></b>								
Boron (B)	< 0.05	mg/L		0.05	1	EPA 200.7	10/22/2013 14:46	MHH7131
<b><u>TOTAL RECOVERABLE METALS BY ICP-MS</u></b>								
Arsenic (As)	< 1	ug/L		1	1	EPA 200.8	10/22/2013 14:25	DJSULL1
Cadmium (Cd)	< 1	ug/L		1	1	EPA 200.8	10/22/2013 14:25	DJSULL1
Chromium (Cr)	< 1	ug/L		1	1	EPA 200.8	10/22/2013 14:25	DJSULL1
Copper (Cu)	< 1	ug/L		1	1	EPA 200.8	10/22/2013 14:25	DJSULL1
Nickel (Ni)	< 1	ug/L		1	1	EPA 200.8	10/22/2013 14:25	DJSULL1
Selenium (Se)	< 1	ug/L		1	1	EPA 200.8	10/22/2013 14:25	DJSULL1
Silver (Ag)	< 1	ug/L		1	1	EPA 200.8	10/22/2013 14:25	DJSULL1
Zinc (Zn)	< 1	ug/L		1	1	EPA 200.8	10/22/2013 14:25	DJSULL1



**APPLIED SPECIATION  
AND CONSULTING, LLC**

18804 Northcreek Parkway Bothell, WA, 98011  
Tel: (425) 483-3300 Fax: (425) 483-9818  
[www.appliedspeciation.com](http://www.appliedspeciation.com)

October 24, 2013

Jay Perkins  
Duke Energy Analytical Laboratory  
Mail Code MGO3A2 (Building 7405)  
13339 Hagers Ferry Rd.  
Huntersville, NC 28078  
(704) 875-5245

Project: Belews - FGD WWTS (Bi-Monthly & Flex Fuel) (LIMS# J13100218)

Mr. Perkins,

Attached is the report associated with four (4) aqueous samples submitted for total mercury and selenium speciation analysis on October 13, 2013. The samples were received in a sealed cooler at 11.9°C on October 14, 2013. Selenium speciation analysis was performed via ion chromatography inductively coupled plasma dynamic reaction cell mass spectrometry (IC-ICP-DRC-MS). Mercury quantitation was performed via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS). Any issues associated with the analysis are addressed in the following report.

If you have any questions, please feel free to contact me at your convenience.

Sincerely,

A handwritten signature in black ink, appearing to read "Jeremy Maute".

Jeremy Maute  
Project Coordinator  
Applied Speciation and Consulting, LLC



Applied Speciation and Consulting, LLC

Report prepared for:

Jay Perkins  
Duke Energy Analytical Laboratory  
Mail Code MGO3A2 (Building 7405)  
13339 Hagers Ferry Rd.  
Huntersville, NC 28078

Project: Belews - FGD WWTS (Bi-Monthly & Flex Fuel) (LIMS# J13100218)

October 24, 2013

## 1. Sample Reception

Three (3) aqueous samples were submitted for selenium speciation analysis on October 13, 2013. Three (3) additional samples were submitted for total mercury quantitation. All samples were received in acceptable condition on October 14, 2013 in a sealed container at 11.9°C.

Applied Speciation and Consulting strongly recommends that all samples submitted for selenium speciation quantitation remain at a temperature of  $\leq 6^{\circ}\text{C}$  to maintain sample integrity prior to analysis.

All samples were received in a laminar flow clean hood, void of trace metals contamination and ultra-violet radiation, and were designated discrete sample identifiers. The 40mL borosilicate glass vials submitted for total mercury were preserved with bromine monochloride (BrCl) solution. The resulting samples were stored in a secure polyethylene container, known to be free from trace metals contamination, until the analyses could be performed.

An aliquot of each sample requiring selenium speciation evaluation was filtered (0.45 $\mu\text{m}$ ) and each filtrate was stored in a secure, monitored cryofreezer (maintained at a temperature of  $-80^{\circ}\text{C}$ ) until selenium speciation analysis could be performed via ion chromatography inductively coupled plasma dynamic reaction cell mass spectrometry (IC-ICP-DRC-MS).

## 2. Sample Preparation

All sample preparation is performed in laminar flow clean hoods known to be free from trace metals contamination. All applied water for dilutions and sample preservatives are monitored for contamination to account for any biases associated with the sample results.

Total Mercury Quantitation by CV-ICP-MS All samples and preparation blanks for total mercury quantitation were preserved with 2% (v/v) BrCl. The resulting samples were analyzed for mercury via cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS).

Selenium Speciation Analysis by IC-ICP-DRC-MS Prior to analysis, an aliquot of each sample was filtered with a syringe filter (0.45 $\mu$ m) and injected directly into a sealed autosampler vial. No further sample preparation was performed as any chemical alteration of a sample may shift the equilibrium of the system, resulting in changes in speciation ratios.

### 3. Sample Analysis

All sample analysis is preceded by a minimum of a five-point calibration curve spanning the entire concentration range of interest. Calibration curves are performed at the beginning of each analytical day. All calibration curves, associated with each species of interest, are standardized by linear regression resulting in a response factor. All sample results are **instrument blank corrected** to account for any operational biases associated with the analytical platform.

Prior to sample analysis, all calibration curves are verified using second source standards which are identified as initial calibration verification standards (ICV).

Ongoing instrument performance is identified by the analysis of continuing calibration verification standards (CCV) and continuing calibration blanks (CCB) at a minimum interval of every ten analytical runs.

Total Mercury Quantitation by CV-ICP-MS The sample fractions for total mercury quantitation were analyzed by cold vapor inductively coupled plasma mass spectrometry (CV-ICP-MS) on October 18, 2013. Aliquots of each sample are reacted with a reductant in-line and transported to a gas-liquid separator. The volatile elemental mercury that is formed is then swept by a stream of argon gas into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and separated on the basis of their mass-to-charge ratio (m/z) by a mass spectrometer. A solid-state detector detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Selenium Speciation Analysis by IC-ICP-DRC-MS Each sample for selenium speciation analysis was analyzed by ion chromatography inductively coupled plasma dynamic reaction cell mass spectrometry (IC-ICP-DRC-MS) on October 17, 2013. An aliquot of each sample is injected onto an anion exchange column and mobilized by a basic (pH > 7) gradient. The eluting selenium species are then introduced into a radio frequency (RF) plasma where energy-transfer processes cause desolvation, atomization, and ionization. The ions are extracted from the plasma through a differentially-pumped vacuum interface and travel through a pressurized chamber (DRC) containing a reaction gas which preferentially reacts with interfering ions of the same target mass to charge ratios (m/z). A solid-state detector

detects ions transmitted through the mass analyzer and the resulting current is processed by a data handling system.

Retention times for each eluting species are compared to known standards for species identification.

#### **4. Analytical Issues**

The overall analyses went well and no significant analytical issues were encountered. All quality control parameters associated with these samples were within acceptance limits, with the following exceptions.

The selenocyanate matrix spike and matrix spike duplicate (MS/MSD) recoveries were below the lower control limit of 75% (43.8% and 38.0%, respectively). The spiking solution also contained selenite, and the spike recoveries for selenite were above the upper control limit of 125% (150.7% and 143.6%, respectively). The low recoveries for selenocyanate correlate with the elevated recoveries of selenite, suggesting that the sample matrix induces species conversion. No species conversion was observed in the bracketing continuing calibration verification standards (CCVs), demonstrating that the applied method stabilizes these species in solution. Since the low recoveries observed for selenocyanate in the MS and MSD are therefore attributable to the sample matrix, no corrective actions were required. The reported results are deemed representative of the supplied samples and indicate that the spiked sample matrix is oxidizing in nature.

The estimated method detection limits (eMDLs) for selenite, selenate, and selenocyanate are generated from replicate analyses of the lowest standard in the calibration curve. Not all selenium species are present in preparation blanks; therefore, eMDL calculations based on preparation blanks are artificially biased low.

The eMDL for methylseleninic acid and selenomethionine is calculated from the average eMDL of selenite, selenate, and selenocyanate. The calibration does not contain methylseleninic acid or selenomethionine due to impurities in these standards which would bias the results for other selenium species.

The eMDL for mercury has been calculated using the standard deviation of the preparation blanks preserved and analyzed concurrently with the submitted samples.

If you have any questions or concerns regarding this report, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'J. Maute', with a stylized flourish extending to the right.

Jeremy Maute  
Project Coordinator  
Applied Speciation and Consulting, LLC

Total Mercury & Selenium Speciation Results for Duke Energy  
 Project Name: Belews - FGD WWTS (Bi-Monthly & Flex Fuel)

Contact: Jay Perkins

LIMS #J13100218

Date: October 24, 2013

Report Generated by: Jeremy Maute

Applied Speciation and Consulting, LLC

**Sample Results**

Sample ID	Total Hg	Se(IV)	Se(VI)	SeCN	MeSe(IV)	SeMe	Unknown Se Species (n)
FGD Purge Eff	NR	176	56.2	ND (< 6.7)	ND (< 5.0)	ND (< 5.0)	0 (0)
BioReactor 1 Inf	0.137	52.2	58.4	ND (< 1.3)	9.3	ND (< 1.0)	0 (0)
BioReactor 2 Inf	0.0241	NR	NR	NR	NR	NR	NR
BioReactor 2 Eff	0.0656	ND (< 0.95)	ND (< 0.72)	ND (< 1.3)	ND (< 1.0)	ND (< 1.0)	0 (0)

All results reflect the applied dilution and are reported in µg/L

NR = Analysis not requested

ND = Not detected at the applied dilution

SeCN = Selenocyanate

MeSe(IV) = Methylseleninic acid

SeMe = Selenomethionine

Unknown Se Species = Total concentration of all unknown Se species observed by IC-ICP-MS

n = number of unknown Se species observed

Total Mercury & Selenium Speciation Results for Duke Energy  
 Project Name: Belews - FGD WWTS (Bi-Monthly & Flex Fuel)

Contact: Jay Perkins

LIMS #J13100218

Date: October 24, 2013

Report Generated by: Jeremy Maute  
 Applied Speciation and Consulting, LLC

**Quality Control Summary - Preparation Blank Summary**

Analyte (µg/L)	PBW1	PBW2	PBW3	PBW4	Mean	StdDev	eMDL*	eMDL 5x	eMDL 50x	eMDL 250x
Hg	0.0002	0.0002	0.0002	0.0001	0.0002	0.0001	0.0001	0.0002	-	-
Se(IV)	0.00	0.00	0.00	0.00	0.00	0.00	0.019	-	0.95	4.8
Se(VI)	0.00	0.00	0.00	0.00	0.00	0.00	0.014	-	0.72	3.6
SeCN	0.0	0.0	0.0	0.0	0.0	0.0	0.027	-	1.3	6.7
MeSe(IV)	0.0	0.0	0.0	0.0	0.0	0.0	0.020	-	1.0	5.0
SeMe	0.0	0.0	0.0	0.0	0.0	0.0	0.020	-	1.0	5.0

eMDL = Estimated Method Detection Limit

\*Please see narrative regarding eMDL calculations

**Quality Control Summary - Certified Reference Materials**

Analyte (µg/L)	CRM	True Value	Result	Recovery
Hg	NIST 1641d	1568	1691	107.8
Se(IV)	LCS	4.79	4.83	101.0
Se(VI)	LCS	4.74	4.54	95.8
SeCN	LCS	4.46	4.55	102.0
MeSe(IV)	LCS	3.24	3.51	108.5
SeMe	LCS	4.66	4.55	97.6

Total Mercury & Selenium Speciation Results for Duke Energy  
 Project Name: Belews - FGD WWTS (Bi-Monthly & Flex Fuel)

Contact: Jay Perkins

LIMS #J13100218

Date: October 24, 2013

Report Generated by: Jeremy Maute  
 Applied Speciation and Consulting, LLC

**Quality Control Summary - Matrix Duplicates**

Analyte (µg/L)	Sample ID	Rep 1	Rep 2	Mean	RPD
Hg	Batch QC	0.0078	0.0077	0.0078	1.3
Se(IV)	BioReactor 2 Eff	ND (< 0.95)	ND (< 0.95)	NC	NC
Se(VI)	BioReactor 2 Eff	ND (< 0.72)	ND (< 0.72)	NC	NC
SeCN	BioReactor 2 Eff	ND (< 1.3)	ND (< 1.3)	NC	NC
MeSe(IV)	BioReactor 2 Eff	ND (< 1.0)	ND (< 1.0)	NC	NC
SeMe	BioReactor 2 Eff	ND (< 1.0)	ND (< 1.0)	NC	NC

ND = Not detected at the applied dilution

NC = Value was not calculated due to one or more concentrations below the eMDL

**Quality Control Summary - Matrix Spike/ Matrix Spike Duplicate**

Analyte (µg/L)	Sample ID	Spike Conc	MS Result	Recovery	Spike Conc	MSD Result	Recovery	RPD
Hg	Batch QC	2.000	2.172	108.2	2.000	2.215	110.4	2.0
Se(IV)	BioReactor 2 Eff	278.0	418.8	150.7*	278.0	399.3	143.6*	4.8
Se(VI)	BioReactor 2 Eff	252.3	276.0	109.4	252.3	263.8	104.6	4.5
SeCN	BioReactor 2 Eff	228.8	100.2	43.8*	228.8	86.9	38.0*	14.2

\*Low/high recovery is due to matrix induced species conversion. See case narrative.



cooler #1

Analytical Laboratory Use Only.



DUKE ENERGY®

[illegible]

5)Business Unit :	20003	6)Process: BMCEFGD	Mail Code:
8)Oper. Unit:	BC00	9)Res. Type:	10)Reso. Center:

Se Speciation Bottle ID	<sup>13</sup> Sample Description or ID
	FGD Purge Eff
	EQ Tank Eff.
	BioReactor 1 Inf
	BioReactor 2 Inf
	BioReactor 2 Eff
	Filter Blk
	Metals Trip Blk

[illegible]

Requested Turnaround \_\_\_\_\_  
 21 Days \_\_\_\_\_  
 7 Days \_\_\_\_\_  
 • 48 Hr \_\_\_\_\_  
 • Other 14 days  
 • Add. Cost Will Apply  
10/23/13

* B by TRM/ICP	As, Cd, Cr, Cu, Ni, Se, Ag, Zn by TRM/IMS	1 <sup>st</sup> = No Hg	
(1) No ice present in cooler on receipt. only water w/ samples submerged, Dec			10/14/13



# CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM

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## Duke Energy Analytical Laboratory

Mail Code MGO3A2 (Building 7405)  
13339 Hagers Ferry Rd  
Huntersville, N. C. 28078  
(704) 875-5245  
Fax: (704) 875-4349

## Analytical Laboratory Use Only

ORDER# <b>713100218</b>	MATRIX: OTHER <b>2.3</b>	Samples Originating From NC SC
Logged By <b>B6002gc</b>	Date & Time <b>10/10/13 11:49</b>	SAMPLE PROGRAM Water Ground NPDES Drinking Water UST RCRA Waste
Vent	Cooler Temp (C)	

18 Page 1 of 2  
**DISTRIBUTION**  
ORIGINAL to LAB,  
COPY to CLIENT

1) Project Name: <b>Belews - FGD</b>	2) Phone No:
<b>WWTS (Bi-Monthly &amp; Flex Fuel)</b>	
2) Client: <b>Bill Kennedy, Melonie Martin, Wayne Chapman</b>	Use Project: <b>WWTS FGD-Routine 2013</b>
5) Business Unit: <b>20003</b>	6) Process: <b>BMCEFGD</b> Mail Code:
8) Oper. Unit: <b>BC00</b>	9) Res. Type: 10) Reso. Center:

AS&C PO#650910		19 Preserv.: 1=HCl 2=H <sub>2</sub> SO <sub>4</sub> 3=HNO <sub>3</sub> 4=Ice S=None		4	4	3.4	3.4	2.4	4	
MR #	Customer to complete all appropriate non-shaded areas.		19 Analyses Required	TDS	Br (Dionex)	Metals* + Hg 245.1**	Se (IMS), filtered	NO3-NO2	Hg 200.8 (V_AS&C)	Se, speciation - vendor to AS&C (Important to place filled bottle back into both baggies)
11 Comp.	16 Grab	13 Sample Description or ID	Date	Time	Signature					
Sampling conducted: 2nd and 4th Wednesday										
		FGD Purge Eff	10/9	0700	[Signature]	1	1	1	1	1
		EQ Tank Eff.		0705			1	1		
		BioReactor 1 Inf		0710			1**	1	1	1
		BioReactor 2 Inf		0715			1**		1	
		BioReactor 2 Eff		0720		1	1	1**	1	1
		Filter Blk						1		
		Metals Trip Blk		0800			1**			

Filtering of the Se is performed in the field please provide a filter blank too.

Return Kit to Travis Thorton @ Belews

Customer to sign & date below - fill out from left to right.

1) Relinquished By [Signature] 10-9-2013 14:45	2) Accepted By [Signature] 10/10/13 12:02
3) Relinquished By	4) Accepted By
5) Relinquished By	5) Accepted By:
7) Relinquished By	8) Accepted By:
9) Seal/Locked By	10) Seal/Lock Opened By
11) Seal/Locked By	12) Seal/Lock Opened By
Comments	

\* B by TRM/ICP As, Cd, Cr, Cu, Ni, Se, Ag, Zn by TRM/IMS 1\*\*=No Hg

Customer, IMPORTANT!  
Please indicate desired turnaround.

22 Requested Turnaround
21 Days _____
*7 Days _____
*48 Hr _____
*Other _____
*Add. Cost Will Apply